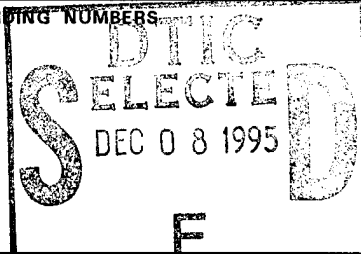


REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-018	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE April 1995		3. REPORT TYPE AND DATES COVERED
4. TITLE AND SUBTITLE Biocell Treatment of Petroleum Contaminated Soils			5. FUNDING NUMBERS 	
6. AUTHOR(S) Jeff Heath				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Facilities Engineering Service Center Port Hueneme, CA 93043-4328			8. PERFORMING ORGANIZATION REPORT NUMBER TDS-2017-ENV	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESSES			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES				
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.			12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) Many military installations face the problem of disposing of small quantities of petroleum hydrocarbon contaminated soils. These soils are found at facilities such as fuel storage tanks, maintenance and vehicle wash areas, and training areas where fuel has been spilled. The private sector also faces similar problems at service stations and maintenance garages.				
<div style="float: left; font-size: 2em; font-weight: bold; margin-right: 20px;">19951204 071</div> <div style="float: right; text-align: right;">DTIC QUALITY INSPECTED 3</div>				
14. SUBJECT TERMS Biocell treatment, petroleum contaminated soils, total petroleum hydrocarbons (TPH)			15. NUMBER OF PAGES 2	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL	



TechData Sheet

TDS-2017-ENV

April 1995



A Partnership to Improve the Environment

Naval Facilities Engineering Service Center
Port Hueneme, California 93043-4328

Biocell Treatment of Petroleum Contaminated Soils

U. S. Army Corps of Engineer
Waterways Experiment Station, Vicksburg, MS

INTRODUCTION

Many military installations face the problem of disposing of small quantities of petroleum hydrocarbon contaminated soils. These soils are found at facilities such as fuel storage tanks, maintenance and vehicle wash areas, and training areas where fuel has been spilled. The private sector also faces similar problems at service stations and maintenance garages.

Biocells are engineered systems that use naturally occurring microbes to degrade fuels and oils into simpler, non-hazardous, and non-toxic compounds. Biocells are able to treat soils contaminated with petroleum based fuels and lubricants, including diesel, jet fuel, and lubricating and hydraulic oils. The microbes use the contaminants as a food source and thus destroy them.

By carefully monitoring and controlling air and moisture levels, degradation rates can be increased and total treatment time reduced over natural systems.

PURPOSE OF DEMONSTRATION

The pilot scale evaluation of the biocell system at the Naval Construction Battalion Center, in Port Hueneme, CA, will include optimization of moisture and aeration rates, investigation of "low tech" analytical methods, air emissions control, and improvements in overall ease of operation of the field scale system.

ADVANTAGES OF BIOCELLS

- Costs are low when compared to incineration or dig and haul disposal of contaminated soil.
- Protects both groundwater and air from leachate and/or fugitive emissions associated with *in situ* treatment or land farming.
- Operates without major engineering/scientific oversight.
- Contaminants are destroyed.
- Faster overall process compared to most *in situ* systems.

TECHNICAL DESCRIPTION

A combination of the best aspects of the low cost remediation technologies of landfarming and bioventing form the framework of the biocell treatment technology. Both of these technologies have been widely used in remediation, however, both have disadvantages. Bioventing, an *in situ* technology, does not require excavation, but also does not protect groundwater from further contamination during the remediation process. The major disadvantage of landfarming is fugitive air emissions, which are becoming more strictly regulated.

The biocell uses well known biological processes to degrade total petroleum hydrocarbons (TPH) into carbon dioxide and water. Under optimum nutrient, moisture, oxygen, pH, and temperature conditions, native bacteria in the contaminated soil use the TPH as a food source. Clean soil can then be returned to the original excavation site or used as fill where needed. Biocell treatment is similar to the concept of land farming; except the soil bed is contained and covered to prevent leaching and volatilization of TPH into the surrounding environment. Gases generated during operation on the biocell are captured in a granulated activated carbon adsorption system placed outside the biocell.

The biocell system converts commercial roll-off dumpsters into fully contained bioremediation units (Figure 1). The conversion is performed by adding appropriate plumbing and materials for nutrient and air supply (Figure 2). Individual units can treat up to 40 cubic yards of contaminated soil at a time, and several units may be combined at one site for larger soil volumes. The Army's

Waterways Experiment Station (WES) has developed the 10 cubic yards biocell, which will be tested at CBC, Port Hueneme. The biocell has additional equipment for monitoring and evaluation in the research stage of the program.

A significant part of the WES research is aimed towards simplifying the technology for the user. The intent is to develop a system using "off-the-shelf" materials, available worldwide. Simple agricultural style moisture sensors will be investigated for maintaining optimal biodegradation conditions in the biocell. WES will also develop design and operation manuals and material lists for a "conversion kit" for use by Department of Defense installations.

For more information about the biocell system, contact Mr. Jeff Heath, Manager, Technology Application Branch, Code ESC414, at (805) 982-1657 or DSN: 551-1657, or call our 24-hour number: (805) 982-4070 or DSN: 551-4070.

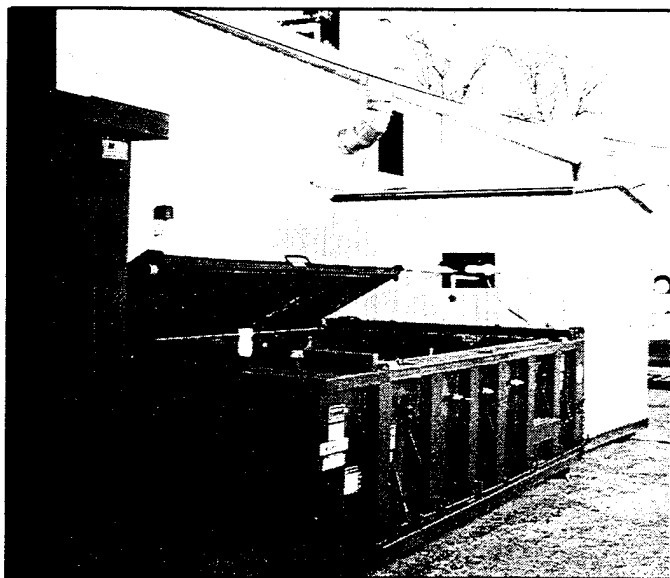


Figure 1



Figure 2

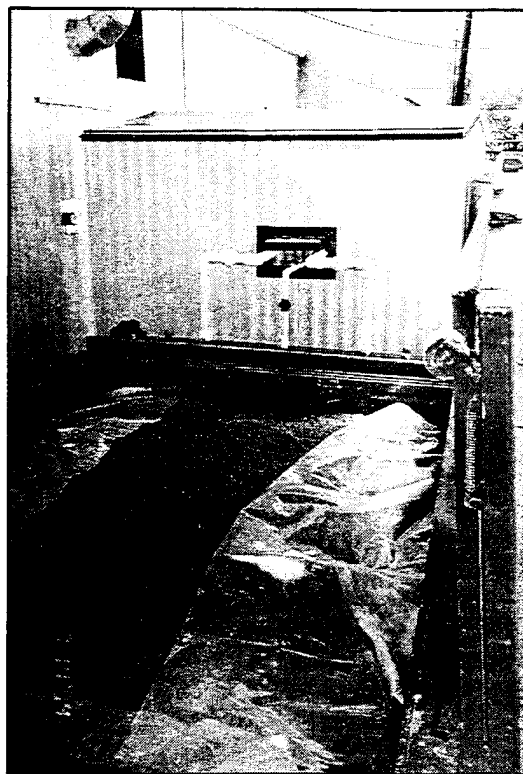


Figure 3